WHAT IS CLAIMED IS:

1. Apparatus for differentiating a sub-population of blood cells from other blood cells and particles in a blood sample, said apparatus comprising:

(a) an optical flow cell through which the individual blood cells and particles of a blood sample can be made to pass, one at a time;

(b) a light source for directing a beam of radiation along an optical axis to irradiate individual blood cells and particles passing through the optical flow cell;

(c) an optical detector positioned at a location to detect back-scattered radiation from an irradiated particle passing through the optical flow cell and for producing a first electrical signal proportional to the level of back-scattered radiation detected, said optical detector comprising: (i) a photodetector; (ii) a plurality of optical fibers, each fiber having a light-collection end, an opposing light-discharge end, and an intervening light-transport region for transmitting, by multiple internal reflections, light collected by said light-collecting end to said light-discharge end, said light-discharge end being positioned proximate a light-sensitive face of said photodetector; and (iii) a fiber optic holder for positioning the respective light-collecting ends of said optical fibers at a location to collect said back-scattered radiation from an irradiated blood cell or particle;

(d) a second detector positioned at a location to detect at least one other measurable effect produced by a particle passing through said optical flow cell and for producing a second electrical signal proportional to the detected level of the other measurable effect; and

(e) a logic and control unit for receiving the first and second electrical signals and for differentiating said sub-population of blood cells from said other blood cells and particles based on the first and second electrical signals received.

2. The apparatus as defined by claim 1 wherein said fiber optic holder is designed to support a linear portion of each fiber in the vicinity of its light collecting end so that each light-collecting fiber end receives back-scattered light from irradiated particles within substantially the same angular range.

3. The apparatus as defined by claim 2 wherein said back-scatter is measured at a nominal back-scatter angle between about 7 degrees and 24 degrees, plus or minus 1 degree.

4. The apparatus as defined by claim 1 wherein said light-collecting ends of said optical fibers are arranged in a circular pattern centered about said optical axis.

5. The apparatus as defined by claim 2 wherein the respective axes of said supported linear portions of the optical fibers extend parallel to said optical axis of said particle-irradiating beam.

6. The apparatus as defined by claim 2 wherein the respective axes of said supported linear portions of the optical fibers converge at or near the anticipated location of the light-scattering source.

7. The apparatus as defined by claim 1 wherein said second detector is a second optical detector that operates to sense another optical effect resulting from the irradiation of the blood cells and particles by said beam of radiation.

8. The apparatus as defined by claim 7 wherein said other optical effect is the intensity level of forwardly scattered radiation within a predetermined angular range.

9. The apparatus as defined by claim 8 wherein said predetermined angular range is about 11 degrees, plus or minus about 1 degree.

10. The apparatus as defined by claim 8 wherein said predetermined angular range is about 16 degrees, plus or minus about 1 degree.

11. The apparatus as defined by claim 7 wherein said other optical effect is the level of light loss in the irradiating beam caused by the presence of an irradiated blood cell or particle in said beam.

12. The apparatus as defined by claim 7 wherein said other optical effect is the intensity level of side-scattered radiation.

13. The apparatus as defined by claim 1 wherein said second detector operates to sense a change in an electrical current flowing through said flow cell as occasioned by the passage of blood cells and particles through said flow cell.

14. The apparatus as defined by claim 1 wherein means are provided for diffusing said beam of radiation after radiating said particles, whereby any beam reflections occurring after particle irradiation that would otherwise interfere with the detection of back-scattered radiation from said irradiated particles is minimized.

15. The apparatus as defined by claim 14 wherein said second detector comprises a housing defining an elongated bore hole through which said beam of radiation passes and becomes diffused by said diffusing means upon irradiating said particles, said housing serving to prevent any substantial amount of diffused radiation from being detected by said first or second detectors.

16. The apparatus as defined by claim 1 wherein said second detector comprises:

(a) a plurality of elongated optical fibers, each operating to receive light at a light-collecting end thereof and to transmit such light, via multiple internal reflections, to an opposing light-discharge end at which the transmitted light is discharged, each of said optical fibers having a central optical axis extending longitudinally through said optical fibers;

(b) at least one photodetector positioned adjacent to the respective light-discharge ends of said optical fibers to receive and detect discharged light; and

(c) an optical fiber holder for supporting a portion of each optical fiber in the vicinity of its respective light-collecting so that the respective optical axes of the supported fiber portions converge toward the apparent position of blood cells and particles irradiated by said beam of radiation.

17. Apparatus as defined by claim 16 wherein said optical fiber holder comprises a fiber-retaining plate having a concave surface through which a plurality of bore holes are formed in said plate for supporting said fiber portions.

18. Apparatus for differentiating a sub-population of blood cells from other blood cells and particles in a blood sample, said apparatus comprising:

(a) an optical flow cell through which the individual blood cells and particles of a blood sample can be made to pass, one at a time;

(b) a light source for directing a beam of radiation along an optical axis to irradiate individual blood cells and particles passing through the optical flow cell;

(c) an optical detector positioned at a location to detect back-scattered radiation from an irradiated blood cell or particle passing through the optical flow cell and for producing a first electrical signal proportional to the level of back-scattered radiation detected;

(d) a second detector for detecting the effect each blood cell and particle has on an electrical current passing through said optical flow cell simultaneously with said blood cell or particle; and

(e) a logic and control unit for receiving the first and second electrical signals and for differentiating said sub-population of blood cells from said other blood cells and particles based on the first and second electrical signals received.